

RECEIVED
CENTRAL FAX CENTER

JUN 12 2007

Appl. No. 10/537,954
Amdt. dated June 12, 2007
Reply to Office Action of March 12, 2007
Page 6

REMARKS

Claims 15-29 are pending. Claims 1-14 have been cancelled in previous correspondence. Claims 19-22 and 26-29 are withdrawn from consideration. Claims 15-18 and 23-25 have been rejected under 35 U.S.C. §112, first paragraph, under 35 U.S.C. §112, second paragraph, under 35 U.S.C. §102, and under 35 U.S.C. §103. Claims 15-18 and 25 have been amended. Support for these amendments is found in at least paragraphs [0041] and [0043] of the specification. Claims 15-18 and 23-25 remain for consideration upon entry of the present Amendment. No new matter has been added.

Claims 15-18 and 23-25 have been rejected under 35 U.S.C. §112, first paragraph, as allegedly failing to comply with the written description requirement. The Examiner alleges that the claims contain subject matter that was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. In particular, the Examiner alleges that there is neither an adequate description nor enabling disclosure of what is meant by and encompassed by the term "at least about" in claims 15 and 25.

Claims 15-18 and 25 have been amended by removing the word "about." Support for the term "at least," however, is found in at least paragraph [0009] of the specification as filed. In view of the amendment, Applicants respectfully assert that claim 15 (and claims 16-18, 23, and 24, which depend from claim 15) and claim 25 comply with the written description requirement within the meaning of 35 U.S.C. §112, first paragraph. Accordingly, Applicants respectfully request that the Examiner withdraw the rejections of claims 15-18 and 23-25 under 35 U.S.C. §112, first paragraph.

Claims 15-18 and 23-25 have been rejected under 35 U.S.C. §112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter that Applicants regard as the invention. In particular, the Examiner alleges that the claims are vague, indefinite, and incomplete, and the metes and bounds thereof cannot be determined, particularly in regard to the phrase "at least about."

Appl. No. 10/537,954
Amdt. dated June 12, 2007
Reply to Office Action of March 12, 2007
Page 7

Also, the Examiner alleges that the word "type" extends the scope of the expression so as to render the language of the claim indefinite.

Claims 15-18 and 25 have been amended. In claim 15, the reference to "a nuclear reactor of the boiling water type" has been amended to a nuclear rod for "a boiling water reactor." In claims 15-18 and 25, the word "about" has been removed leaving the term "at least," for which support is found in at least paragraph [0009] of the specification. In view of these amendments, Applicants respectfully assert that claims 15 and 25 (and claims 16-18, 23, and 24, which depend from claim 15) are definite within the meaning of 35 U.S.C. §112, second paragraph. Accordingly, Applicants respectfully request that the Examiner withdraw the rejections of claims 15-18 and 23-25 under 35 U.S.C. §112, second paragraph.

Claims 15-18 and 23-25 have been rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 3,677,894 to Ferrari (hereinafter "Ferrari"). In view of the above amendments, the rejection is traversed and reconsideration is respectfully requested.

Ferrari discloses a fuel element 10 that includes a plurality of fuel pellets 12 disposed within a tubular cladding 14. (Ferrari, column 3, lines 63-66.) A body 24 of a thermally decomposable compound is disposed on the upper end of the fuel pellets 12. The purpose of the thermally decomposable body 24 is to generate a gas to create an internal pressure within the fuel element 10. The compound may be an oxalate, which can decompose into carbon dioxide or a mixture of carbon dioxide and carbon monoxide at elevated temperatures. (Ferrari, column 3, line 73 to column 4, line 12.)

Ferrari fails to disclose, teach, or suggest a nuclear fuel rod for a boiling water nuclear reactor having an initial fill gas arranged in a closed inner space, the fill gas containing a proportion of inert gas and a proportion of carbon monoxide having a ratio based on the partial pressures thereof of at least 0.03, as recited in claim 15. In Ferrari, carbon monoxide is generated in situ using a decomposable solid body, whereas in the present invention as recited in claim 15, the nuclear fuel rod has an initial fill gas arranged in a closed space. Thus, Ferrari lacks this initial fill gas arranged in the closed inner space and instead opts for the generation of a gas in situ. An initial fill gas arranged

Appl. No. 10/537,954
Amdt. dated June 12, 2007
Reply to Office Action of March 12, 2007
Page 8

in a closed inner space, as recited in claim 15, is not one that is generated in situ using a decomposable solid body. More specifically, because the fill gas is arranged in the closed inner space and is initially present when the components are assembled into the fuel rod, the fill gas necessarily cannot be generated using a decomposable solid body, as it is in the Ferrari device.

Ferrari also fails to disclose, teach, or suggest a nuclear fuel assembly comprising a plurality of nuclear fuel rods, each fuel rod having an initial fill gas arranged in a closed inner space, the fill gas containing a proportion of inert gas and a proportion of carbon monoxide, as recited in claim 25. As stated above, in Ferrari, carbon monoxide is generated in situ using a decomposable solid body, whereas in the present invention as recited in claim 25, the nuclear fuel rod has an initial fill gas arranged in a closed space. Ferrari opts for the in situ generation of a gas in lieu of an initial fill gas arranged in a closed inner space. An initial fill gas arranged in a closed inner space, as recited in claim 25, is not one that is generated in situ using a decomposable solid body.

Because Ferrari fails to disclose, teach, or suggest a nuclear fuel rod for a boiling water nuclear reactor having an initial fill gas arranged in a closed inner space, the fill gas containing a proportion of inert gas and a proportion of carbon monoxide having a ratio based on the partial pressures thereof of at least 0.03, as recited in claim 15, claim 15 is not anticipated by the Ferrari reference. Furthermore, because Ferrari fails to disclose, teach, or suggest a nuclear fuel assembly comprising a plurality of nuclear fuel rods, each fuel rod having an initial fill gas arranged in a closed inner space, the fill gas containing a proportion of inert gas and a proportion of carbon monoxide, as recited in claim 25, claim 25 is likewise not anticipated by the Ferrari reference. For at least these reasons, claims 15 and 25 are allowable, and Applicants respectfully request that the Examiner withdraw the rejections of claims 15 and 25.

Dependent claims, by definition, further define the subject matter of the independent claims from which they depend. Because claims 16-18, 23, and 24 depend from claim 15, claims 16-18, 23, and 24 add recitations that further define the subject matter of independent claim 15. Because claim 15 is believed to be allowable for at least the reasons presented above, claims 16-18, 23, and 24 are therefore also believed to be

Appl. No. 10/537,954
Amdt. dated June 12, 2007
Reply to Office Action of March 12, 2007
Page 9

allowable. Consequently, Applicants respectfully request that the rejections of claims 16-18, 23, and 24 be withdrawn.

Claims 15-18 and 23-25 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Ferrari. The Examiner alleges that Ferrari teaches a fuel rod wherein an inert gas is included with a thermally decomposable compound that generates carbon monoxide, that the combination of the inert gas and carbon monoxide comprises the fill gas, and that the proportion of carbon monoxide to the fill gas is a matter of design choice and/or optimization within prior art conditions or through routine experimentation.

The teachings of Ferrari are presented above.

Ferrari fails to disclose, teach, or suggest a nuclear fuel rod for a boiling water nuclear reactor having an initial fill gas arranged in a closed inner space, the fill gas containing a proportion of inert gas and a proportion of carbon monoxide having a ratio based on the partial pressures thereof of at least 0.03, as recited in claim 15. In Ferrari, carbon monoxide is generated in situ using a decomposable solid body, whereas in the present invention as recited in claim 15, the nuclear fuel rod has an initial fill gas arranged in a closed space. Ferrari lacks an initial fill gas arranged in a closed inner space. An initial fill gas arranged in a closed inner space, as recited in claim 15, is not one that is generated in situ using a decomposable solid body. More specifically, because the fill gas is arranged in the closed inner space and is initially present when the components are assembled into the fuel rod, the fill gas necessarily cannot be generated using a decomposable solid body, as it is in the Ferrari device.

Ferrari also fails to disclose, teach, or suggest a nuclear fuel assembly comprising a plurality of nuclear fuel rods, each fuel rod having an initial fill gas arranged in a closed inner space, the fill gas containing a proportion of inert gas and a proportion of carbon monoxide, as recited in claim 25. As stated above, in Ferrari, carbon monoxide is generated in situ using a decomposable solid body, whereas in the present invention as recited in claim 25, the nuclear fuel rod has an initial fill gas arranged in a closed space. Ferrari lacks this initial fill gas arranged in a closed inner space. An initial fill gas arranged in a closed inner space, as recited in claim 25, is not one that is generated in situ using a decomposable solid body. More specifically, because the fill gas is arranged in

Appl. No. 10/537,954
Amdt. dated June 12, 2007
Reply to Office Action of March 12, 2007
Page 10

the closed inner space and is initially present when the components are assembled into the fuel rod, the fill gas necessarily cannot be generated in situ using a decomposable solid body, as it is in the Ferrari device.

Because Ferrari fails to disclose, teach, or suggest what Applicants recite in claim 15, namely, a nuclear fuel rod for a boiling water nuclear reactor having an initial fill gas arranged in a closed inner space, the fill gas containing a proportion of inert gas and a proportion of carbon monoxide having a ratio based on the partial pressures thereof of at least 0.03, Ferrari fails to teach all of the claim recitations of Applicants' invention. Furthermore, because Ferrari fails to disclose, teach, or suggest what Applicants recite in claim 25, namely, a nuclear fuel assembly comprising a plurality of nuclear fuel rods, each fuel rod having an initial fill gas arranged in a closed inner space, the fill gas containing a proportion of inert gas and a proportion of carbon monoxide, Ferrari again fails to teach all of the claim recitations of Applicants' invention. Consequently, because not all of the claim recitations are taught by the cited reference, Applicants' claims 15 and 25 are necessarily non-obvious, and Applicants respectfully request that the Examiner withdraw the rejections of claims 15 and 25.

Claims 15-18 and 23-25 have been rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent Application No. 2001/0019597 to Rudling et al. (hereinafter "Rudling") in view of either one of U.S. Patent No. 4,957,696 to Marechal et al. (hereinafter "Marechal") or Ferrari. The Examiner alleges that Rudling teaches a nuclear fuel rod designed to provide protection against hydrogen permeation, the rod comprising a cladding of zirconium alloy, a plurality of nuclear fuel pellets, a fill gas of helium and carbon dioxide, and a pre-oxidation with zirconium oxide. The Examiner further alleges that either one of Marechal or Ferrari teaches the fill gas in a nuclear rod to have the claimed pressure to withstand external pressure. The Examiner then alleges that, therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus as disclosed by Rudling by the teaching of either one of Marechal or Ferrari to pressurize the fill gas to the claimed value to gain the advantages thereof.

Appl. No. 10/537,954
Amdt. dated June 12, 2007
Reply to Office Action of March 12, 2007
Page 11

Rudling discloses a cladding tube 1 for a light water reactor with nuclear fuel provided therein as fuel pellets 2. The cladding tube 1 has a liner layer 6 on its inner surface 5 on which a coating 7 is deposited. (Rudling, paragraph [0042].) A mixture of gases at a substantially atmospheric pressure may be used to treat the coating against hydration. (Rudling, paragraph [0024].) The gases, which may be inert, may be carbon dioxide and carbon monoxide. (Rudling, claims 9, 12, and 19.)

Marechal discloses a fuel element rod for a pressurized water-cooled nuclear reactor and having a cylindrical can 2 closed at both ends. Fuel material pellets 6 are stacked in the can 2, and a compression spring 9 made from hafnium bears on the pellets from one end of the can. (Marechal, Abstract.) In order to avoid any deformation of the rod, an inert gas is maintained in the can between 0.1 and 8 MPa to provide an internal pressure. (Marechal, column 1, lines 34-39.)

The teachings of Ferrari are presented above.

Both Rudling and Marechal fail to disclose, teach, or suggest a nuclear fuel rod for a boiling water nuclear reactor having an initial fill gas arranged in the closed inner space in order to fill the rest of the inner space, whereby the fill gas contains a proportion of inert gas and a proportion of carbon monoxide having a ratio based on the partial pressures thereof of at least 0.03, as recited in claim 15. Rudling fails altogether to teach an initial fill gas arranged in a closed inner space, the fill gas containing inert gas and carbon monoxide – the gases in the Rudling device, which may be carbon monoxide, are used to deposit the coating on the inner liner. Thus, once the coating is deposited during the manufacture of the tube, there is no initial fill gas in the tube, as there is in the nuclear fuel rod recited in claim 15. While there appears to be an inert gas in the cylindrical can of the Marechal device, Marechal fails to disclose a fill gas containing both an inert gas and carbon monoxide, as recited in claim 15. Consequently, neither Rudling nor Marechal, individually or in combination, disclose, teach, or suggest a nuclear fuel rod for a boiling water nuclear reactor having an initial fill gas arranged in the closed inner space in order to fill the rest of the inner space, whereby the fill gas contains a proportion of inert gas and a proportion of carbon monoxide having a ratio based on the partial pressures thereof of at least 0.03, as recited in claim 15.

Appl. No. 10/537,954
Amdt. dated June 12, 2007
Reply to Office Action of March 12, 2007
Page 12

Rudling in view of Marechal also fails to disclose, teach, or suggest a nuclear fuel assembly comprising a plurality of nuclear fuel rods, each fuel rod having an initial fill gas arranged in the closed inner space in order to fill the rest of the inner space, whereby the fill gas contains a proportion of inert gas and a proportion of carbon monoxide, as recited in claim 25. The same reasons for why Rudling in view of Marechal fails to disclose, teach, or suggest the nuclear fuel rod as recited in claim 15 apply as to why Rudling in view of Marechal fails to disclose, teach, or suggest the nuclear fuel assembly comprising the plurality of nuclear fuel rod as recited in claim 25.

Rudling in view of Ferrari fails to disclose, teach, or suggest a nuclear fuel rod for a boiling water nuclear reactor having an initial fill gas arranged in the closed inner space in order to fill the rest of the inner space, whereby the fill gas contains a proportion of inert gas and a proportion of carbon monoxide having a ratio based on the partial pressures thereof of at least 0.03, as recited in claim 15. As stated above, Rudling fails altogether to teach an initial fill gas arranged in a closed inner space, the fill gas containing inert gas and carbon monoxide because the gases in the Rudling device, which may be carbon monoxide, are used to deposit the coating on the inner liner. With regard to the Ferrari device, Ferrari discloses the in situ generation of carbon monoxide using a decomposable solid body. Accordingly, Ferrari necessarily does not teach an initial fill gas of inert gas and carbon monoxide in the inner space. Consequently, neither Rudling nor Ferrari, individually or in combination, discloses, teaches, or suggests a nuclear fuel rod for a boiling water nuclear reactor having an initial fill gas arranged in the closed inner space in order to fill the rest of the inner space, whereby the fill gas contains a proportion of inert gas and a proportion of carbon monoxide having a ratio based on the partial pressures thereof of at least 0.03, as recited in claim 15.

Rudling in view of Ferrari also fails to disclose, teach, or suggest a nuclear fuel assembly comprising a plurality of nuclear fuel rods, each fuel rod having an initial fill gas arranged in the closed inner space in order to fill the rest of the inner space, whereby the fill gas contains a proportion of inert gas and a proportion of carbon monoxide, as recited in claim 25, for the same reasons as Rudling in view of Ferrari fail to disclose, teach, or suggest the nuclear fuel rod of claim 15.

Appl. No. 10/537,954
Amdt. dated June 12, 2007
Reply to Office Action of March 12, 2007
Page 13

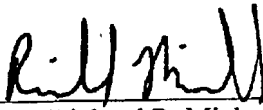
Claims that depend from a claim that is non-obvious are themselves necessarily non-obvious. Because claims 16-18, 23, and 24 depend from claim 15, and because claim 15 is asserted to be non-obvious for the reasons presented above, claims 16-18, 23, and 24 are likewise necessarily non-obvious. Applicants, therefore, respectfully submit that claims 16-18, 23, and 24 are allowable. Accordingly, Applicants respectfully request that the rejections of claims 16-18, 23, and 24 be withdrawn.

Applicants believe that the foregoing amendments and remarks are fully responsive to the Office Action and that the claims herein are allowable. An early action to that effect is earnestly solicited.

If the Examiner believes that a telephone conference with Applicants' attorneys would be advantageous to the disposition of this case, the Examiner is invited to telephone the undersigned.

Applicants believe that no fees are due with the submission of this Amendment. If any charges are incurred with respect to this Amendment, they may be charged to Deposit Account No. 503342 maintained by Applicants' attorneys.

Respectfully submitted,

By 
Richard R. Michaud
Registration No. 40,088
Attorney for Applicants

Michaud-Duffy Group LLP
CenterPoint
306 Industrial Park Road
Suite 206
Middletown, CT 06457-1532
Tel: (860) 632-7200
Fax: (860) 632-8269